The invention claimed is:

1. A microreactor comprising:

at least one etched microchannel structure within a substrate having at least one inlet and at least one outlet,

at least one integrated heater, and

at least one catalyst material between said inlet and said outlet.

2. The microreactor of claim 1, further comprising:

at least one porous membrane located between said inlet and said outlet.

3. The microreactor of claim 1, wherein said catalyst material is selected from the group consisting of platinum, platinum-ruthenium, nickel, palladium, copper, copper oxide, ceria, zinc oxide, alumina, combinations thereof and alloys thereof.

4. The microreactor of claim 1, wherein the integrated heater is a resistive heater.

5. The microreactor of claim 1, wherein the integrated heater is a microcumbustion heater.

6. The microreactor of claim 1, wherein the said outlet connects to a manifold of a fuel cell.

7. The microreactor of claim 1, wherein said plurality of catalyst materials located between said inlet and said outlet are packed into said microchannel.

8. The microreactor of claim 2, wherein said catalyst materials located between said inlet and said outlet are imbedded in said porous membrane.

9. The microreactor of claim 1, wherein said inlet connects to a liquid chemical reservoir.

10. The microreactor of claim 2, wherein said capillary microchannel is interfaced with said porous membrane such that the flow moves in a horizontal direction from said inlet through said microchannel and moves in a vertical direction from said microchannel through said outlet.

11. The microreactor of claim 1, further comprising:
a catalytic combustion microfluidic heat source.

12. The microreactor of claim 1, wherein said substrate is a material selected from the group consisting of silicon, glass, and ceramic.

13. The microreactor of claim 1, wherein said heater is integrated at said inlet.

14. The microreactor of claim 1, wherein said heater is integrated along said microchannel.

15. The microreactor of claim 2, wherein said heater is integrated at said porous membrane.

16. The microreactor of claim 2, wherein said porous membrane comprises a porous thick film selected from the group consisting of porous silicon, anodic alumina, zerogel, glass and combinations thereof.

17. The microreactor of claim 2, wherein the catalyst material covers a surface area of the porous membrane measuring about $1m^2/cm^3$ or greater.

18. The microreactor of claim 1, wherein the capillary microchannels support a fuel flow rate in the range of about 1 microliter/minute to about 600 microleters/minute.

19. The microreactor of claim 2, further comprising:

a porous getter structure located at the exit side of said porous membrane.

20. The microreactor of claim 19, wherein the surface area and volume of the getter structure is about $1m^2/cm^3$ or greater.

21. The microreactor of claim 1, wherein said microreactor has means for processing more than one type of liquid fuel component into hydrogen fuel.

22. A microreactor comprising:

a top substrate and a bottom substrate such that at least one capillary microchannel is contained between said top substrate and said bottom substrate, said capillary microchannel having at least one inlet and at least one outlet,

a plurality of catalyst materials located between said inlet and said outlet,

at least one porous membrane located at said outlet, and

at least one integrated heater.

23. The microreactor of claim 22, wherein said plurality of catalyst materials located between said inlet and said outlet are packed into said microchannel.

24. The microreactor of claim 22, wherein said catalyst materials located between said inlet and said outlet are imbedded in said porous membrane.

25. The microreactor of claim 22, wherein said capillary microchannel is interfaced with said porous membrane such that the flow moves in a horizontal

direction from said inlet through said microchannel and moves in a vertical direction from said microchannel through said outlet.

26. The microreactor of claim 22, wherein the said outlet is connected to a manifold of a fuel cell.

27. The microreactor of claim 22, wherein said catalyst material is selected from the group consisting of platinum, platinum-ruthenium, nickel, palladium, copper, copper oxide, ceria, zinc oxide, alumina, combinations thereof and alloys thereof.

28. The microreactor of claim 22, wherein said substrate is a material selected from the group consisting of silicon, glass, and ceramic.

29. A method for forming a chemical microreactor comprising:

forming at least one capillary microchannel within a substrate having at least one inlet and at least one outlet,

forming at least one porous membrane,

imbedding the porous membrane with at least one catalyst material,

integrating at least one heater into the chemical microreactor,

interfacing the capillary microchannel with a liquid chemical reservoir at the inlet of the capillary microchannel,

interfacing the capillary microchannel with the porous membrane at the outlet of the capillary microchannel, such that gas flow moves in a horizontal direction from the inlet through the microchannel and moves in a vertical direction from the microchannel through the outlet.

30. The method of Claim 29, additionally including forming the porous membrane using at least one of the techniques selected from the group consisting

of thin film deposition, thick film formation, electrochemical etching, plasma etching and selective chemical etching.

32. The method of Claim 29, additionally including imbedding the catalyst material within the porous membrane by a thin film deposition technique.

33. The method of Claim 29, additionally including imbedding the catalyst material by ion exchange.

34. The method of Claim 29, additionally including imbedding the catalyst material by solgel doping.

35. A method of operating a chemical microreactor comprising:

delivering a fuel source from an inlet through a microfluidic capillary that is packed with a catalyst material to a porous membrane,

heating the microfluidic capillary and the porous membrane to a temperature between about 250 °C and about 650 °C, and

reforming the fuel source into hydrogen and a plurality of other gaseous materials while simultaneously passing at least the hydrogen through the porous membrane into at least one gas flow channel that is connected to at least one fuel cell.

36. The method of Claim 35, further comprising:

carrying the hydrogen and the other gaseous materials away from the porous membrane through the gas flow channel,

adsorbing the other gaseous materials with a porous getter structure located at the exit side of the porous membrane, and

allowing the hydrogen gas to diffuse through the gas flow channel to the fuel cell.

37. The method of Claim 35, further comprising:

heating the inlet to a temperature between about 250 °C and about 650 °C.

38. A method of operating a chemical microreactor comprising:

delivering a fuel source through a first microfluidic capillary to a porous membrane that is imbedded with a catalyst material,

heating the microfluidic capillary and the porous membrane to a temperature between about 250 °C and about 650 °C, and

reforming the fuel source into hydrogen and a plurality of other gaseous materials while simultaneously passing at least the hydrogen through the porous membrane into at least one gas flow channel that is connected to at least one fuel cell.

39. The method of Claim 38, further comprising:

carrying the hydrogen and the other gaseous materials away from the porous membrane through the gas flow channel,

adsorbing the other gaseous materials with a porous getter structure located at the exit side of the porous membrane, and

allowing the hydrogen gas to diffuse through the gas flow channel to the fuel cell.

40. The method of Claim 38, further comprising:

heating the inlet to a temperature between about 250 °C and about 650 °C.

41. A method comprising:

providing means for generating a hydrogen fuel from a liquid source, and delivering the hydrogen fuel to a fuel cell.